Improving the readiness for change – Addressing information concerns of internal stakeholders in the smartPORT Hamburg

Full Paper

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Abstract

Digital transformation as a driving force changes organizations, industries, and society in general. In this, Internet of Things (IoT) exhibits a specific potential that permeates all layers from business models over (cross-) organizational processes to (cloud-) systems, data flows and sensor equipped infrastructures. In order to improve readiness for change we take a stakeholder-oriented perspective. The paper aims at understanding information and communication needs of internal stakeholders in order to become co-partners of innovation throughout the enterprise. Based on a literature review and an empirical study during the explorative phase of the IoT-based transformation in a major European port, information concerns are gathered and structured. A prototype of a web-based information offering is presented. Its evaluation leads to further theoretical and practical implications.

Keywords

Digital transformation, stakeholder, internal organization, information need, change communication.

Introduction

The widespread adoption and increasing diffusion of digital technologies are reshaping a broad range of activities not only in organizations, but throughout whole industries and society in general. Changing consumer behavior, rapid innovation cycles of products and services as well as new ways of collaboration in dynamic cross-industrial business ecosystems are constant pressures that organizations have to face today. In order to gain success or simply survive in this rapidly changing environment nearly every part of an organization is being reinvented and transformed through the use of digital technologies. The nature of change may be along various perspectives and involves diverse enterprise areas: technology landscapes as driving forces of new business opportunities, supported business processes, enabled business models and improved customer engagement as well as adaptations in organizational structure (Henriette et al. 2015). As these different areas have multiple interconnections, well-informed decisions in context of digital transformation need to cope with challenges of this increased complexity (Babar and Yu 2015).

While digital transformation projects have a strong impact on the organization as a whole, there is still a lack of research on management and realization of these projects, stakeholder-related challenges and in general on the term and scope of digital transformation (Henriette et al. 2015). However, the importance of understanding and addressing the needs of stakeholders who are affected by transformation initiatives or who are responsible for driving them within and beyond organizational borders is being stressed (Aier

and Saat 2011). Therefore, our research is guided by the following question: What information and communication concerns arise from the perspective of internal organizational stakeholders in the context of digital transformation projects? More precisely, in this contribution we focus on those internal stakeholders that are neither drivers nor involved parties, but those who should be engaged in adopting new explored technologies in their respective fields and thus become an active part of the transformation. Based on both a conducted literature analysis and an empirical study we aim at developing a concept and a prototype for an information offering that addresses the identified information concerns and thus contributes to a still relatively scarce body of knowledge on the respective topic.

In the following section, an overview of the theoretical background on the interrelated topics is provided. We continue with a description of the organizational context, in which the empirical investigation of internal information concerns in context of IoT-related transformation was conducted. After presenting the methodological considerations of our research process, the results from the literature and our empirical analysis are summarized consecutively. The gap between the findings is highlighted and discussed. Thereafter, the gained insights are consolidated and the developed prototype for an information offering regarding IoT-related transformation is introduced. First results from its evaluation in the organizational context where the study was conducted are presented. This paper closes with a conclusion and an outlook on future research issues.

Theoretical background

Digital Transformation and Internet of Things

The fundamental change through digital technologies may be driven along different perspectives, but mainly aims at meeting long-term objectives and is closely related to a company's strategy, value propositions, and its risks. "In order to be effective, Business Transformation needs to align changes in people, processes, and technology" (Winter et al. 2012). Transformation is often caused by external drivers and collaborations and is planned and controlled by top management level executives. However, internal structures are important in terms of enterprise culture and mindset of relevant stakeholders who affect or are affected by transformation initiatives. Digitally mature companies not only stand out due to the use of new technologies but also due to the commitment to transformative strategies supported by collaborative cultures (Kane et al. 2015). Both leaders and employees in digitally mature companies should have access to necessary information for developing digital skills. The IoT-related transformation provides a vivid example for the previously described complexity of transformation initiatives (Vermesan et al. 2009, p.10). Smart objects become active participants in business, information and social processes, exchanging data and information they have received from the environment, and responding to the detected changes. With blurring boundaries of physical and virtual worlds, it is important to understand the additional complexity and required extensions on different organizational levels in order to enable new opportunities.

Corporate change and innovation communication

The scope of corporate communication encompasses all the communication techniques and media that are used for interactions with relevant internal and external stakeholders (Cornelissen 2004). Internal communication aims at informing as well as increasing motivation, willingness to cooperate and professional capabilities of executives and employees. Therefore, an analysis of current stakeholder problems and needs, as well as their preferences regarding communication channels and visualizations is of a great priority (Welch and Jackson 2007). Change communication pursuits several goals, these include educating employees in the company vision and strategic goals, motivating employee support, encouraging higher performance and effort, limiting misunderstandings and aligning employees behind the company's strategy (Barrett 2002). To this end, change communication controls the perceived characteristics of the change project from the employees' point of view, thereby reducing uncertainty, their resistance potential and affecting their readiness for change as well as creating a sense of organizational community (DiFonzo and Bordia 1998; Elving 2005). Often a change depends on people altering their behavior or their attitudes; therefore, the cognitive as well as the emotional component must be taken into account. Various contributions with different perspectives on change exist in the area of change management, yet Kuipers et al. (2014) see a need for more in-depth empirical studies of the

change processes within various public contexts providing details of change interventions and behaviors of the involved people. The communication about innovation is aiming "to systematically plan, implement, and evaluate communication about innovations. It should create an understanding of and trust in innovations and position the organization involved as the driving force behind it" (Zerfass 2005, p.12). Communication on innovation takes place on several levels. On one hand it is supposed to inform about innovations and influence the opinions, on the other hand it promotes the innovation process itself by laying a foundation for the generation of new ideas (Mast 2016). The acceptance of an innovation depends on its perceived characteristics and the communicative behavior of decision-makers. Relevant information for communicating embodies the relative advantages of innovations compared to previous techniques, the compatibility with values and needs as well as the complexity and the expected benefits.

Context: The Hamburg smartPORT Initiative

The empirical insights on information needs that arise from the perspective of organizational stakeholders regarding the adoption of new digital technologies in their respective fields were gathered within a study that we conducted in Hamburg Port Authority (HPA), where the launched smartPORT initiative for exploration of IoT-enabled transformation was analyzed. The port of Hamburg is one of the largest European ports, and as a public institution with around 1800 employees, HPA is responsible for maintenance and development of the port infrastructure and is therefore concerned with its efficiency, security and economy. The activities include IT-based control of shipping, operation and maintenance and expansion of various (port-related) facilities, roads and real-estate. The goals of the launched smartPORT initiative range from decreasing energy consumption and reducing emissions, to developing predictive maintenance scenarios for port-related infrastructure, as well as achieving a better traffic and parking space management. For example, the prePORT Parking project aims at improving parking space management by equipping a parking lot for trucks outside the main port area with telematics. Our research project at the HPA started after the results of the exploratory IoT projects were identified and decisions concerning the roll-out phase needed to be made. To this point the projects were promoted mostly externally, using various communication instruments like print media, presentations as well as online channels to raise the awareness for this innovative transformation initiative. In the previous section the value of communication in transformation- and change-related settings was emphasized. The innovative character of the smartPORT projects as well as the complex nature of involved technologies that are explored lead to the emergence of new questions and information demands of internal organizational stakeholders. Thus, engaging internal stakeholders in the transformation process by addressing their information needs becomes a priority. Thereby a creation of an information offering for raising of awareness and acceptance, which elaborates on the existing body of knowledge as well as practice-oriented insights is intended.

Methodology

Our research is motivated by emerging challenges in current practices on digital transformation initiatives and especially stakeholder-oriented information concerns that arise in this context. We aim at exploring the information concerns of internal organizational stakeholders in context of digital, and specifically IoT-related, enterprise transformation both in literature and practice. Furthermore, we aim at consolidating the gained insights by developing a concept for an innovative information offering for internal communication according to previously derived requirements. Hence, we address the existing problem of currently missing participation and unclear information needs of those internal organizational units which are or were not directly involved in the explorative IoT-projects (s. above). The goal is to enhance their understanding in order to adopt the new technology and so far achieved solutions to their processes and tasks and thus spread the innovations throughout the organization. In this regard, we assessed the structuring of the research process according to the Design Science Paradigm (Hevner 2004; Österle et al. 2010) as appropriate. In the Analysis phase a structured literature analysis and an empirical study were conducted. The Design phase is dedicated to the consolidation of the previously derived findings and the construction of a solution artefact. It is achieved by developing a prototype for an innovative information offering addressing the relevant concerns in context of digital, especially IoT-based transformation initiatives. Further, the developed prototype is evaluated in the organizational setting. The gained insights build a foundation for validating the results as well as outlining future research questions.

Procedure of the conducted literature analysis

In order to explore the existing body of knowledge with the aim of identifying concerns and information needs of internal stakeholders as well as instruments for addressing them in context of digital, and especially IoT-related, transformation initiatives, a structured literature analysis guided by the literature reviewing framework of Brocke et al. (2009) was conducted. After examining the theoretical background on topics interconnected to our study, search phrases enclosing following terms and related synonyms were constructed: digital transformation; Internet of Things; change management; internal communication; stakeholder; information need. In the first phase of our search process, we focused on identifying contributions that specifically address information needs in context related to digital transformation initiatives. Therefore, a search in the following online literature databases was conducted: AIS Electronic Library, SpringerLink, ACM Digital Library, IEEE Xplore Digital Library, ProQuest, Science Direct, Taylor & Francis, EBSCOhost, Emerald Insight and Google Scholar. In the second phase the search scope was broadened by encompassing contributions and works on change and innovation communication in general, as the results regarding specific context of digital transformation were very scarce. In both phases, contributions in English as well as German languages and published from 2000 to 2016 were enclosed in the review scope. However, basic literature and literature, which was obtained by searching forwards and backwards, was partly derived from the period before the year 2000. The literature found was evaluated for relevance during the search process by means of title, abstract or overall text. We structured the found relevant sources according the main research fields they address: digital transformation (27 contributions); change communication (38 contributions) and stakeholder demands (14 contributions). The resulting set of relevant sources was used for applying a qualitative document analysis (Bowen 2009). The literature insights regarding our research question "What information and communication concerns arise from the perspective of internal organizational stakeholders in the context of digital transformation projects?" are presented in the section below using a conceptual organization as similar concepts are clustered together along following dimensions: information concerns in context of digital and IoT-related transformation; general content-related requirements for change communication within an organization; medium-related requirements for change communication; as well as requirements for engaging to participation. The representative examples of contributions along these dimensions are further detailed.

Procedure of the conducted empirical study

Empirical evidence was gathered by conducting interviews and document analysis in previously described organizational context. For this work, the semi-structured form of the interview has been chosen (Myers and Newman 2007) as the order and formulation of the questions had to be adapted to the scope of employee's organizational activities. All interviews have been carried out face-to-face, lasted between 30-90 minutes and were divided in two series. At first, the information and communication concerns, preferences regarding the visualization of information as well as new questions that arise from the perspective of organizational employees regarding digital transformation and the smartPORT initiative were examined. In total, five interviews were conducted in this series with different types of internal organizational stakeholders, both directly involved in transformation activities and those so far little to non-affected by the transformation initiative. This scope was chosen to provide a broad picture of opinions and the widest possible range of results. The interview partners were chosen from different organizational units in order to provide coverage of perspectives from various organizational domain fields. For example, strategic business units were considered regarding their overall view on smartPORT initiative, whereas the role of facility management was chosen in respect to its view on practical implementations. In the second series, three interviews with experts from IT Strategy, Marketing and Digitization organizational units were conducted. The goal of this series was to gain insight into requirements and preferences regarding internal communication and to obtain information on the state of digital transformation at HPA. The analysis of the gained empirical data was based on the approach of Kaiser (2004). The first step was to secure the gained empirical insights and therefore all interviews have been recorded and transcribed. Afterwards, the coding of the resulted text material was carried out. To the text sections with relevant information for our research question conceptual categories were assigned. Those were partly derived from the used questionnaire and partly emerged from the replies of the interviewed employees. In the next step, the insights from the interviews were structured in a table along

the derived categories to identify possible similarities and differences along the conducted interviews. Throughout this process, the findings were discussed among the authors and iteratively refined.

Information and communication concerns of internal organizational stakeholders in context of digital transformation projects

Summary of the conducted literature analysis

Information concerns of internal stakeholders in digital transformation context

No research contributions could be found with regard to the information requirements and questions of internal stakeholders concerning IoT-related digital transformation initiatives specifically. However, concerning digital transformation in general, Matt, Hess and Benlian (2015) state that it leads to increased demand of product-related skills and more competent employees. Internal stakeholders need to know, whether products, processes or skills are affected by the change. Fitzgerald et al. (2014) add that the use of new technologies such as "social media, mobile, analytics and embedded devices" requires a different mindset than usual transformative technologies. They recommend clarifying the effectivity and benefit of the technologies in order to overcome obstacles like technology fatigue and to inform about the pay-off of the transformation.

General content-related requirements for change communication within an organization

Several questions of the internal stakeholder concerning the change process in general can be identified in the literature. In this regard, employees are interested in goals, benefits and reasons behind the change. Furthermore, the implementation and the personal impact of the change are of general interest for employees (Koch 2004). Some concrete questions about the future of their everyday work reflect the emerging uncertainty of employees during change processes, for example, "Can I still do perform my tasks on the same way I used to do them?" (DiFonzo and Bordia 1998). Only few specific questions of the employees are mentioned in the literature, but many authors refer to success factors related to the content of change communication. According to Kotter (1997), it is essential to justify the necessity and the urgency of the planned changes and to create understanding for vision, strategy, reasons and the overall concept. Goals, benefits and disadvantages should be communicated as well as precise implementation plans and individual consequences of the planned changes (Rogers 2003). Regarding effective change communication, Barrett (2002) emphasizes the need for targeted messages combining simple, meaningful and consistent messages taking into account the characteristics of the audience. Armenakis et al. (2007) provide a framework including five beliefs that influence the reaction towards a change. Besides the perception of a *discrepancy* between the current and the desired state, the employees should consider the planned change as appropriate to achieve the target state (*appropriateness*). Additionally the employees have to perceive the success of the change as possible (*efficacy*) and supported by the management (*principal support*). The last belief contributing to the approval of the change addresses the *valence* of the change and the personal benefits.

Medium-related requirements for change communication within an organization

A multitude of communication instruments like e-mails, corporate audio/TV and blogs can be used for internal communication. A topical website in the intra-corporate intranet offers a broad overview as well as detailed information (Pfannenberg and Tesch 2013). The selection of an appropriate medium for change communication is a complex task and depends on different influence factors, namely the *communication medium* and its characteristics, the current *phase of the change process* and the *demands and preferences* of the employees. Besides the richness of the medium, one has to differentiate between mass-oriented and personal instruments and between existing instruments and the development of new communication tools (Koch 2004). He recommends connecting mass-oriented and personal instruments to combine a high coverage with the possibility to communicate complex information. Although existing instruments have the advantage that employees are familiar with them, only new communication instruments can gain attention (Heyder 2014). Literature concerning media preferences of employees reveals that the preference of communication instruments strongly depends on the transmitted content (Drum 2010; Sinickas 2005).

Engaging to participation

Participation of employees in change processes correlates positively with reducing their resistance regarding the change process and thereby enhancing the goal achievement and organizational commitment (Lines 2004). Franken (2014) points out that people have a natural need for learning and discovering. Innovation-promoting atmosphere and culture, in which enthusiasm for experimentation is lived, have to be established since the technological change "calls for new management and innovation concepts" (Franken 2014, p.73). Studies have shown that positive emotions can facilitate creative problem solving and exchange of ideas (Isen et al. 1987).

Insights from the conducted empirical study

In general, the interviewed employees feel well informed about the smartPORT initiative. Although general information concerning special projects and the overall vision are well known, detailed information like technical expertise are unknown and partly also not wanted. However, the employees mention that their colleagues are often not well informed and that the term smartPORT is often considered to be fuzzy and unclear. The empirical research has delivered a range of general and detailed information demands from the side of the employees. The overall information requirements include an overview of the smartPORT projects as well as a usage scenario connecting the projects. Apart from an overall scenario, the connection between the physical infrastructure and the data world is intriguing. Other aspects of concern are the vision of the smartPORT, the overall objective pursued, the partial objectives and the reasons for the change. One employee states: "I am mostly interested in the vision, the future state that we want to achieve and the existing partial targets." Another employee emphasizes the complexity of the topic: "It is important to have a comprehensive knowledge of this topic (smartPORT) and I don't think that it's enough to explain fragments. Since it is a complex topic, one has to see the whole image, the overall vision." How the projects contribute to the vision is as well of interest as how an alternative scenario without the initiative might look like. In addition to the overview of transformation projects, project-specific details are demanded. This includes the aim and the status of the project and information on whether the project objectives have been achieved. Another often posed question concerns the functionality, meaning both the functionality of the use and the functionality of the underlying technology. Employees are interested in the products and their appearance, the offered services and application possibilities of the smart objects. With regard to the functionality of the technology, the employees ask specific questions about the installed sensors, their abilities, what data the sensors measure and how complex the installation of sensors is. Also, how the information collected by the sensors is processed and passed on to IT systems is a relevant aspect. One interviewee mentions: "I want to know where the data come from and to which IT system they flow. This is relevant for me, since I'd like to know which data I can use for myself." Additionally, the benefit of the smartPORT and the projects is relevant to the employees, as one employee states: "Other questions are 'Who benefits from it?', 'How does it benefit me or my department?'" The employees also need additional information regarding the knowledge of involved stakeholders, be it internal or external stakeholders as well as information about legal issues like data protection. Information on the impact of the smartPORT on their own work is also desired, e.g. "The most important aspect for me is: 'How do I participate in the project?' and 'How does it influence my own work?'" or "What contribution can I make to promote the smartPORT?"

The employees mention several media used to get information about the smartPORT including weekly meetings of department heads, information events and brochures. The intranet isn't used by all employees due to lack of time and overwhelming amount of available information. At the same time, information in the intranet is often outdated, may lack the desired depth and is sometimes inaccessible due to permission restrictions. A more interactive way of information transfer takes place in the showroom, where visitors can see real physical objects, presentations and have the possibility to experience the harbor in a virtual reality environment. The interviews show that from the perspective of the interviewed employees current visualization techniques used for communication could be enhanced. They prefer diversified representations, dynamic elements, pictures, simple and short texts and are open towards innovative visualizations to match innovative content. Nearly all of the interviewed employees see a clear need for the promotion of the smartPORT inside the enterprise: "We have many really great things at the HPA and no one knows it!" Only one employee is of a different opinion, since he believes that not all information needs to be passed on to prevent an informational overload. Another employee describes the smartPORT as a

"closed space", to which only a small group has access to. He calls for more transparency and finds it very important that a sense of community emerges so that all employees identify themselves with the smartPORT. Awareness that everyone can participate actively and can generate ideas has to be established. The goal is to arouse interest leading to the generation of ideas and the transfer of knowledge into new areas. The prerequisite is that the required information is communicated before ideas can be generated.

The empirical analysis shows that the internal stakeholders have both general information demands and special IoT questions like sensors, information streams and location. New interests arise due to the linkage between sensor technology and physical objects in the real world, which leads to a greater tangibility of a complex subject. The growing complexity and interconnectedness created by IoT raises new questions regarding an overall scenario and existing connections. Often, internal stakeholders are interested in the advantages of the smartPORT, which leads to the assumption that IoT is an innovation whose benefits and consequences are difficult to assess. These findings differ from the insights gained through literature analysis in the sense that they show specific technology-related information demands of the employees, whereas mostly general questions regarding the change process are revealed in the literature.

Concept, Prototype and Evaluation

Taking into account the information demands gained through literature analysis and empirical study and the visualization needs of the internal stakeholders, a concept for an information offering aiming at establishing a common understanding and readiness for change in the context of a digital transformation has been developed. In Table 1, the identified information needs from the conducted literature analysis and empirical study are summarized. The last column of the table presents the consolidated view that was derived by aggregating the identified literature and empirical findings that laid the foundation for the structure of the developed prototype.

Information needs derived from literature	Information needs identified in empirical study of IoT-related transformation	Consolidated view for addressing in a prototype of an information offering
<u>General information needs regarding change:</u> Problem situation; Vision; Alternative scenario; Goals; Implementation plans; Services; Products; Benefits; Stakeholder; Consequences; Participation possibilities	<u>General information needs regarding change:</u> Vision; Alternative scenario; Goals; Services; Products; Reasons for change; Benefits; Stakeholder; Project overview; Project information; Participation possibilities	Reasons for change Alternative scenario Vision and goals Underlying technology Use Case Overview of projects For each project: general information, services, usage scenario, benefits, technology, path of data, stakeholder Consequences Participation possibilities
<u>Information needs regarding digital technology:</u> New technologies; Affected business areas of change; Vision; Reasons for change; Benefits of change.	<u>Information needs regarding digital technology:</u> Functionality of use; Functionality of technology; Connection between physical world and data world; Sensors; Information streams and IT systems; Path of data; Access and re-use of data; Legal issues; Use cases / usage scenario; Dependencies	

Table 1. Information needs of organizational stakeholders regarding digital transformation initiatives

The prototypical implementation was constructed and used for the evaluation with internal stakeholders. As a basis, it uses the information needs ranging from general information to project and IoT specific questions, thus the information offering covers a broad range and addresses all employees irrespective of their prior knowledge. The information offering was implemented as an innovative website that can be accessed via the corporate intranet. Since the intranet is used by the majority of the interviewees and is therefore a familiar communication instrument, which can be designed in an innovative manner and as such is considered to be suitable for change communication. The underlying content of the information offering results from the raised information demands and can be grouped and sorted into several clusters, see the last column of Table 1. The detailed information concerns within these clusters were addressed within the respective structure of the prototype.

Since the IoT and the harbor context have a strong location reference, we propose a division of the information, clustered in different 'stations' in the harbor that can be virtually visited. In general, each station takes the users to a certain place in the harbor area, where they move along a predetermined route and have the possibility to get detail information by choosing appearing buttons opening a detail window. For example, the users can choose a project like the above mentioned PrePORT Parking project in the project overview, leading them to the virtual parking space and its location. Besides usage scenarios illustrating the benefits of the project from the perspective of different roles, the station includes information about the path of data (see Figure 1). The information in the detail windows is visualized using different innovative visualization techniques such as parallax scrolling or infographics. The visualizations also take into account the findings concerning the needs of the employees such as simplicity, dynamics or interactivity. As seen in Figure 1 from a birds-eye perspective, both sensor location and IT system location are brought to a map of the harbor area. The users get an overview of the data measured through sensors and the processing of the data until they arrive in form of a service, e.g. an app, at the end user. The developed concept only represents one possible solution. It can however be used as a basis for further exploration and adjustments to the respective transformation project or enterprise.

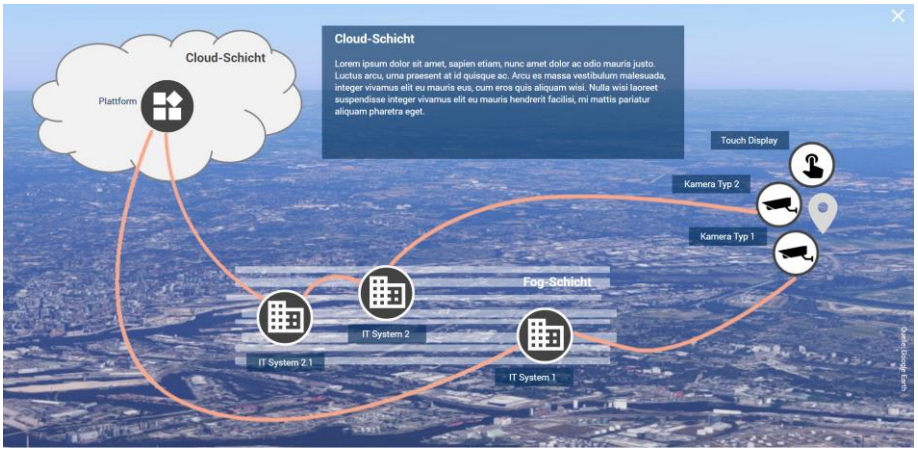

Figure 1: Detail window showing the path of data

Evaluation

The goal of the evaluation was to verify whether the content and the visualizations in the prototypical implementation meet the needs of the employees. Additionally, the transferability to other change projects and the stimulus to participation were requested. A total of ten employees tested and evaluated the prototype by means of an online questionnaire. Most of the participants are settled in the IT department. The participants found the content relevant, interesting and versatile. The distribution of the information on stations and the order of the topics are also evaluated positively. Disagreement prevails with regard to the amount of content and the appropriate detail depth. The visualizations were also rated positively. With regards to the user experience, particularly the controllability needs to be improved in further implementations. Among other results is the insight, that almost all of the participants rate the possibility to bring in ideas as positive and would participate either by reading, commenting or posting their own ideas. The participants agree that the proposed information offering can be used for different transformation projects and in other corporate contexts such as corporate communication.

The positive evaluation of the prototype shows that the concept is suitable for change communication with regard to both content and visualization. Since the user interface was rated positively, the aforementioned barriers to innovation management can be overcome leading to an increased employee engagement.

Conclusion

In this paper, we examined the information needs and concerns of internal organizational stakeholders in context of digital transformation initiatives. Regarding the complex nature of new digital technologies and correlated transformation initiatives as a whole, new questions and information demands arise from the internal organizational perspective in order to successfully adopt these emerging technologies and to generate intended value propositions. During our research process, information and communication concerns from internal organizational perspective were gathered by conducting a literature review and investigating a large-scale digital transformation initiative in an organizational setting. From the analysis of current literature, only a rather general set of information concerns could be derived. The conducted interviews from the empirical study enabled a more detailed view on information and communication concerns. For example, the interview findings enriched the scope of identified information needs regarding specifics of new technologies and highlighted the importance of addressing the participation possibilities. Building on these findings, a prototype for an information offering was developed and first insights of its evaluation in the organizational setting were gained. Based on the derived results, further exploration of information needs and instruments in different transformation settings may enhance the view on possible relevant aspects. The exploration of stakeholder concerns beyond organizational boundaries should also be addressed and may provide important insights regarding the demands of digital transformation initiatives in business ecosystem setting.

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